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VALVULAR HEART DISEASE

THE POTENTIAL ROLE OF CHOLESTEROL CRYSTALS IN THE MECHANICAL INJURY OF HEART VALVES

ACC Poster Contributions
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Background: Hypercholesterolemia has been associated with aortic stenosis but the mechanism of valvular injury has not been fully elucidated. We investigated the role of cholesterol crystals (CC) as a mechanical cause of valvular injury in hypercholesterolemic rabbits and in humans.

Methods: We dissected all four valves in 12 NZW rabbits, 8 fed a cholesterol enriched diet for 6 months and 4 were control. Also, eight human valves from autopsy were evaluated. Cholesterol content in valves was measured by gas chromatography mass spectrometry. Morphology was performed by light, confocal (CM) and scanning electron microscopy (SEM). CM was performed by both dual staining of the endothelium with Acyl-LDL and CC by Bodipy. SEM was performed while avoiding ethanol dehydration.

Results: The cholesterol content was significantly greater in aortic and mitral valves of cholesterol fed rabbits compared to control (Table). Serum cholesterol was significantly higher in cholesterol fed rabbits compared to control (1396.8 ± 444.2 mg/dL vs. 147.4 ± 80.8 mg/dL, $p<0.0001$). CC identified by green luminescence were noted to be perforating the valve surface, stained red. SEM demonstrated sharp needle like CC piercing the valve. Similar observations were noted in human valves and CC were also seen in association with sites of calcification.

Conclusions: These preliminary biochemical and morphological data suggest that CC may be involved in the mechanical damage to valves, predominantly in the left ventricle.

Cholesterol Content in valves

Valve	Control (mcg/wet weight mg) ,Mean (SD)	Hypercholesterolemia (mcg/wet weight mg), Mean (SD)	P value
Aortic Valve	0.47 (0.26)	36.85 (23.85)	0.03
Mitral Valve	0.19 (0.10)	7.02 (11.87)	0.03
Tricuspid Valve	1.10 (0.23)	3.64 (2.48)	0.35
Pulmonary Valve	1.87 (1.64)	3.76 (2.66)	0.23